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Microbial Contamination of Draught Beer in Public Houses

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The above results indicate that for a given dispense rate beer would flow down the smaller diameter pipe with a greater linear velocity and hence the Reynolds number for dispense would be greater than for a larger diameter pipe of the same material. Thus, the smaller diameter pipe would be advantageous from the scouring action and from the smaller volume of beer contained in the pipe. However, problems could be encountered due to the greater pressure required to force the beer along the pipe with the consequent CO_2 break out and resultant foaming of the beer at the bar tap. The factors influencing the selection of the optimum diameter of pipe are therefore extremely complex and more work needs to be done in this area.

Summary

It is clear that public house beer dispense systems are infected by yeasts and bacteria. Due to the low pH, low levels of air and nutrients coupled with the alcohol content and bitter resins found in beer only a small number of genera of organisms are encountered in dispense systems. The origins of these microbes are open to speculation. Some obviously arise in the brewery particularly with cask conditioned beer from the pitching yeast, primings, finings and hops added to the cask. Brewery organisms may also occur in brewery-conditioned beer due to inefficient keg or tank sterilisation or inadequate pasteurisation. Hoses used for the transfer of beer to cellar tanks cause hygiene problems and should be scrupulously cleaned before use. Within the public house itself microbes may arise from the various forms of soil present[16] and from the air.

Growth rate experiments have revealed that yeast strains isolated from the dispense systems possess higher maximum rates of growth per unit amount of biomass (maximum specific growth rate; μ max) than corresponding laboratory strains. For example;

Hansenula anomala (pub)
μ max = 1.11 hr^{-1}
Hansenula anomala (lab)
μ max = 0.23 hr^{-1}
Torulopsis colliculosa (pub)
μ max = 0.69 hr^{-1}
Torulopsis colliculosa (lab)
μ max = 0.21 hr^{-1}

Many of the straing isolated produce sticky mucoid colonies and most are very flocculent adhering to the surface of the pipe lumen. Lacunae that form in the walls of the pipe (either due to secretions from the organisms or possibly as a result of the leaching out of filler material) provide excellent sites for the proliferation of the organisms. No effective scouring of the pipework takes place and viable cells can be isolated from old pipe after cleaning.

Microbes present in the dispense lines can pass down to the keg or cellar tank thereby contaminating the pasteurised beer when connected up to the system. Non-return valves where fitted have to date been ineffective in stopping this contamination. In addition infected kegs or cellar tanks rapidly contaminate clean dispense lines.

Recommended cleaning procedures may be effective providing the dispense lines are new and have no apparent accumulations of organisms. However lapses in regular cleaning give rise to chronic infection of the systems.

Today brewery companies are tending to demand more powerful detergent/sterilisers instead of trying to correct the inherent faults of the dispense systems. Defects in design have become particularly apparent where pubs have changed to the Python multi-pipe cooled systems. In these cases there is a region between the end of the insulated Python system and the bar-tap which stands at bar temperature and creates an environment where severe contamination problems are likely to occur.

Solutions over the long term can only come from re-examining the design of the dispense system and from selecting improved materials which are more suitable for the pipework. Of the materials currently available those which fall into this category include co-extruded nylon in which plasticised nylon is lined with a thin layer of unplasticised nylon. This has the advantages of high rigidity without any possible hazards caused by the migration of plasticiser. The data available indicates that less than 0.001 mg of the plasticiser migrates from one square centimetre of the surface of new unused pipe under the conditions of normal beer dispense. Alternative materials exist in Nylon 12 and a range of crystalline olefin polymers.

Although microbiological contamination does not appear to endanger the health of the customers it certainly affects beer quality. Problems from turbidity and off-flavours caused by microbes are well documented. Improvements may certainly be made by more rigorous cleaning of the dispense tap and keg tapping head as well as the pipework, and by introducing a routine programme for the replacement of dispense pipe. A continuous effort must be made to educate the bar staff and cellar staff to recognise the need for hygiene.

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